Projects and case studies

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Future-proofing Amsterdam's global convention hub to a sustainable urban energy system

Link: RAI urban energy system

Challenge:

RAI Amsterdam is a convention center located in a dense part of the city's business district, hosting 500 events a year. It is a massive employer and contributor to the economy; every euro spent here translates to another seven for the city. But from energy requirements to the every-day effects of event logistics, the carbon footprint is significant.

As a key cultural and economic fixture in the city, the RAI is fully committed to Amsterdam's climate and carbon reduction goals. It has future plans to make the complex in Amsterdam Zuid more integrated with the city and to reshape convention logistics, especially the supply and removal of exhibition materials.

The convention center wants to bring logistics underground with a tunnel connecting all the halls to an underground transshipment center and the outside world. Together with the municipality, the RAI is also looking to see whether it can realize housing and offices on the site.

This creates a natural moment to tackle the sustainability challenges that converge in the area and the rest of the city. Looking to seize opportunities to continue its own development in the most sustainable way, the RAI needed a strategy to signal the best course for transforming energy use and carbon emissions—radically improving integration with the immediate surroundings and future-proofing the center for decades to come.

Solution:

Our solution was to develop, in co-creation with other organizations, a sustainability vision that is part of The Masterplan RAI 2030. The plan encompasses details of its development as a facility and its journey to carbon neutrality—eventually leading to a self-sufficient energy system.

At the forefront is the concept of future-proofing, which considers energy, mobility, logistics, climate resilience, biodiversity, and heating and cooling, adding to the RAI's sustainability credentials and ensuring the center continues to adapt to new challenges and future changes.

To achieve this, The Masterplan offers a host of ideas to transform the way the RAI operates while keeping its core business operational: exhibitions, conventions and meetings. It includes the construction of an underground network of tunnels and a logistics center to remove traffic from the surrounding roads. This would also free up space for new housing and office developments to blend in with the convention infrastructure—resulting in a more multi-functional neighborhood.

Better integration with surrounding communities is desirable, but changing the makeup of the area also presents an opportunity for sharing resources. Examples include setting up a smart grid with a battery system to maximize the use of available renewable energy and adding more green space for livability and biodiversity. These steps will help the RAI contribute to and blend into the urban fabric of Amsterdam, improving the way it relates to the whole city.

To develop an urban energy system as part of the Masterplan, our team fulfills multiple roles: project manager, system integrator and content sparring partner. This included bringing together various stakeholders, such as Shell, Vattenfall, the City of Amsterdam, the Zuidas District, Rabobank and Waternet, who will be key players in realizing such a bold transformation.

Their input will be crucial in realizing ideas for maximizing sustainability, including heating and cooling systems, mobility and logistical solutions, making the area climate resilient, renewable energy transitions and biodiversity preservation. Considering and including a range of solutions and partners in an integrated way is crucial in ensuring the RAI will have the ability to adapt continually and indefinitely.

Impact:

The power of this approach and its realization lie in the complete transformation of how the RAI will look, feel and operate. This goes far beyond a clever suite of updates to improve the sustainability credentials of an important economic fixture in need of a bit of an update. This is a vision for an evolution: from an isolated conference center to a new, thriving neighborhood where people will want to live and work.

It will become a well-integrated and desirable corner of Amsterdam, which could serve as a great example for other parts of the city in terms of meeting climate goals and setting themselves up for a sustainable future.

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Creating a roadmap for a natural gas-free Amsterdam by 2040

Link: Driving energy transition in Amsterdam

Challenge:

The city of Amsterdam has set a goal of eliminating the use of natural gas by 2040, which is 10 years sooner than other regions in The Netherlands. Yet most existing buildings and households in Amsterdam currently rely on natural gas for cooking and heating. Much of the network is also underground and difficult to access in historical or densely inhabited neighborhoods.

In seeking to reduce reliance on natural gas and tackle the problem of global warming, there are endless questions to answer. What are the available alternative energy sources? Which of those will be most cost-effective? How can the impact of the transition on the lives of residents be mitigated? And where to start? To move forward, Amsterdam needed a coherent vision and a solid plan.

Solution:

Arcadis took on the task of investigating how best to achieve the city's goal before creating a strategy to make it happen. This included everything from building a program and advising on how it could be successfully funded; to examining different technical solutions; evaluating which ones might be best applied to specific locations; and assessing in what order the various transformations for different parts of the city should be undertaken. The overarching strategy is captured in the Natural Gas Free Program.

A significant aspect of our team's success hinged on collaboration and the importance of balancing a vast array of different requirements. It also entailed standardizing the approach to support faster and easier decision-making over the coming months and years.

We devised a method called Wijken Aardgasvrij Maken (WAM), or 'making districts natural gas-free', which integrates procedures and decision-making practices from all relevant parties—from multiple local government departments to utility companies to commercial stakeholders and housing cooperations.

One particularly crucial voice is the people of Amsterdam, and we worked hard to find ways to engage local communities, to give them meaningful ways to review and shape the plans as they progress, and to keep in mind the impact that the transition would have on their lives as it is actually taking place.

Aside from setting up WAM to make fast and efficient progress, we also provided technical and financial expertise. The program includes a joint business case that sets out a route to funding the transformation, along with identification of risks and ways to mitigate them, including suggestions of partnerships and joint tendering.

We also studied a vast array of technical solutions, from heat pumps to green natural gas alternatives generated from fermented farm waste. We advised which might be best applied to certain locations or neighborhoods, and what could be the best order in which to transform different parts of the city.

Impact:

Banning natural gas connections in new developments is a big step, and it's becoming more common across the world. The Netherlands made the change as early as 2018, but the tricky part when it comes to reducing fossil fuel dependence is finding ways for existing buildings—which may have been standing for centuries—and their inhabitants to make the switch to renewable sources for their everyday needs. Add to that the ambitious deadlines needed to curb the climate emergency, and the task can seem impossible to surmount.

The impact of the Natural Gas Free Program and its multiple elements, technical advice, financial planning, decision-making strategies and unifying capabilities, is to show that there is an achievable, affordable way forward and to provide the foundations to go out and do it. Using the program as a springboard, Amsterdam is already well on its way to realizing its 2040 goal, adopting a Transition Vision Heat plan toward this.

Redevelopment of natural gas plants and infrastructure for renewable energy storage in the Netherland

Link: eCATS application for renewable energy storage

Challenge:

Natural gas production fields on shore in the Netherlands are in decline and, over the course of the next decade, will reach the end of their field life. Instead, more sustainable renewable energy sources like wind and solar power are fulfilling a growing proportion of the country's total energy needs. However, during the day when energy requirements are often at their highest, there can be an imbalance between supply and demand, causing grid congestion that could result in a loss of energy supply. Meanwhile, because the gas fields will soon stop production, their locations and related infrastructure are becoming redundant. This leaves us with a question: Is there an opportunity to create a more independent renewable energy system by using the redundant gas infrastructure?

Solution:

To answer this question, Arcadis has created the Compressed Air Transport and Storage System, also known as eCATS. This is an integrated system using redundant natural gas infrastructure to store renewable energy in cases of grid congestion—which occurs when transmission facilities do not have sufficient capacity to deliver the energy required—and restore this energy when needed. This system simultaneously solves the problem of wasted surplus renewable energy while maintaining the value of the infrastructure at natural gas plants. This way, the solution for one challenge has presented a perfect opportunity to tackle others.

Compressing surplus renewable energy into air and storing it in out-of-use natural gas pipelines not only reduces grid congestion but means that this energy can be released later via Expanders. This compressed air energy solution has a wide range of applications. Alongside the main characteristic of eCATS being to support energy transition and grid stabilization, this solution can also be used to support district heating or the provision of cold air for ambient conditioning or cooling. This way, the degree of utilization can be increased by up to 95%. Arcadis and Emmett Green are the owners of the eCATS concept and are further exploring this innovative concept with Siemens Energy as the preferred engineer and supplier of the eCATS facility.

These exciting leaps forward are only possible through the seamless collaboration of multiple stakeholders—Arcadis, grid operators, local and national government, landowners, Siemens Energy, and Emmet Green, to name just a few.

Impact:

eCATS is a high-value solution that benefits multiple parties and solves multiple problems. Not only can useful, clean energy be reclaimed when it would otherwise be wasted, but the legacy sites of fossil fuel production are finding a new purpose and becoming a valuable part of the journey to reduce our reliance on climate-harming energy production. It is also an excellent way of reducing the costs of decommissioning.

We are currently collaborating with Siemens Energy and Emmett Green to use eCATS to create a storage facility in the province of Drenthe with a 60 MWh capacity, far outstripping the Netherlands' current largest facility of 25 MWh.

Storing this energy means that the country can continue to increase the proportion of power it uses from renewable sources.

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Getting local support for Germany's nationwide energy transition project

Link Getting local support for Germany's nationwide energy transition project

Challenge:

Germany's nationwide energy transformation, 'Energiewende', is an ambitious transition to a low-carbon and nuclear-free economy. By 2050, the country aims to source at least 80% of its electricity from renewable energy. But with a decentralized renewable energy source—wind power from the north and solar from the south—Energiewende requires different infrastructure to provide reliable electricity.

Using high-voltage, direct current (HVDC) transmission power lines to distribute green electricity was seen as the solution. However, when these electrical superhighways that run for hundreds of kilometers are installed above ground, they have the potential to encroach on private land and negatively affect local ecosystems.

The people who are the intended beneficiaries of this transformation thus find themselves in a predicament: should they support a project that can disrupt their immediate surroundings, or should they object and slow down the country's energy transition, which many of them actually support?

Solution:

In a joint venture with cooperation partners, Arcadis provided a unique combination of services to plan and develop a 700 km HVDC transmission line necessary for Energiewende's success. Our task was to define a process to secure public support through consultations for an area that covers about 180,000 km2.

We understood that using the classic approach of developing a project and securing permits before consulting the public might generate more resistance than support. That is why we started the process by informing the public first about the details and benefits of the project. We then provided them opportunities to actively participate in discussions to voice their concerns before any development began. Ensuring consistent, clear and fast communication, however, is not as simple as it sounds, especially when there are tens of thousands of stakeholders that need to be reached.

Our team developed a software solution called mapARC, which is an external-facing project website linked to a web-based geographic information system (WebGIS). Using the website, online users can check project data on the GIS platform and ask questions that Arcadis can answer directly or refer to the client and project partners.

Visitors to the GIS portal can see anonymized questions posted by others to help increase awareness and avoid duplication. mapARC allowed us to efficiently manage 20,000 stakeholder comments and requests and integrate 7,000 comments with planning relevance into the development phase.

Impact:

By embracing a new approach to project development and using technology to efficiently gather and respond to stakeholders' sentiments, we were able to secure the public's support. The consultations revealed key issues that the people care about, such as nature and biodiversity conservation and the impact on water and agriculture.

It became clear to the project team that the public supports the transition to renewable energy, but there was a need to balance the goals of this nationwide initiative with the needs of those who will be directly affected by the installation of new power lines.

The project was then designed to reflect those sentiments, and the government eventually subsidized the moving of the HVDC transmission lines underground. For the client, our work helped secure the necessary planning permissions and allowed the project to proceed as scheduled and within the allotted budget.

The HVDC transmission lines will serve as the backbone for the nationwide, reliable supply of sustainably generated energy that will power households, businesses and communities. More importantly, Germany will be on track to substantially reduce its reliance on fossil fuels for energy generation, which will help create a carbon-neutral world for its people.

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Helping harness the power of wind as a renewable energy source

Link: Renewable energy turbine prototype

Challenge:

Capturing energy from wind is a powerful tool to realize our society's energy transition goals. One wind turbine with a capacity of 1.67 megawatts at a 33% capacity factor can generate enough energy in 94 minutes to power a typical US home for one month.

But before we can source energy from a field of wind turbines, it's all about perfecting the prototype.

A wind energy company was ready to bring their latest wind turbine design to life. Needing an experienced engineering partner to design and construct the infrastructure required to build the prototype, the company selected Arcadis to lead the engineering, procurement and construction (EPC) of this latest project.

Solution:

Wind turbines are enormous structures that can reach 165 meters in height with blades spanning longer than the length of an American football field. Preparing to build a wind turbine is no small feat—a challenge that demands creativity, collaboration and problem-solving skills. Our team of experts immediately set to work, planning and coordinating project logistics as the lead EPC firm on this wind turbine prototype.

The foundation was a critical component. It was imperative to design proper roads, turbine pads and crane pads to account for the heavy equipment loads and massive crane operations. Cranes needed to lift equipment that weighed as much as 100 tons, which demanded strong geotechnical expertise and civil design to ensure that wind turbine components were delivered securely and that the cranes performing the lifts had a stable operational foundation based on solid understanding of the soil mechanics.

Working during the COVID-19 pandemic added new layers of difficulty to the complex prototype build. Since the wind turbine was a prototype, the team did not have replacements for any broken or misplaced materials. Plus, the pandemic exacerbated the shortage of materials and laborers, so plans were thoroughly scrutinized at every step to maximize available resources.

In addition to providing technical expertise on permitting, civil design, electrical design, civil construction and construction management, we had to be flexible, responsive and timely to deliver the project under uniquely challenging conditions.

Impact:

The wind turbine prototype will now operate under a two-year testing period to collect data and analyze the design while generating power for local communities. Once the study is complete, the wind turbine will be added to the organization's collection of top-of-the-line wind turbines. Perfecting the designs with prototypes like these will help our client fulfill its mission to power our world for future generations with affordable, reliable and sustainable energy.

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Hardening the electric grid in South California

Link: Hardening the electric grid in southern California

Challenge:

Southern California is famed for its year-round sunny weather. But in recent years, Californians have experienced hotter and drier summers—driving peak energy demands and leading to historic wildfires across the state.

One of the nation's largest electric utilities, Southern California Edison (SCE), is eager to lead the charge for modernization. The utility is partnering with our engineering experts to research, redesign and rebuild more than 650 linear miles of transmission and distribution lines to prepare the system for a greener future. However, upgrading a grid that serves more than 15 million people means navigating challenges around climate adaptation, evolving regulations and maintaining service during construction.

Solution:

Our team is bringing together electrical and structural engineers, environmental experts, GIS specialists, geotechnical engineers and CADD designers to develop holistic grid resilience measures. The coordination is critical with such a large grid—SCE's coverage areas vary wildly in terms of topography and weather across the 430 cities and communities it serves.

There are lines located in remote mountainous terrain that challenge accessibility. Some areas support industrial clients that need to account for a larger and more consistent energy supply. Solutions applied, from raising the height of structures to rebuilding entire circuits, require unique combinations of the team's expertise. Our specialists assist SCE with designing solutions, obtaining permits and mitigating environmental impacts for every upgrade.

Impact:

SCE's grid modernization strategy is blazing a trail toward a clean energy future in a state reeling from climate change impacts. Using a diverse team of experts from across engineering and environmental disciplines will allow it to maximize long-term reliability for customers and resilience against climate risk.

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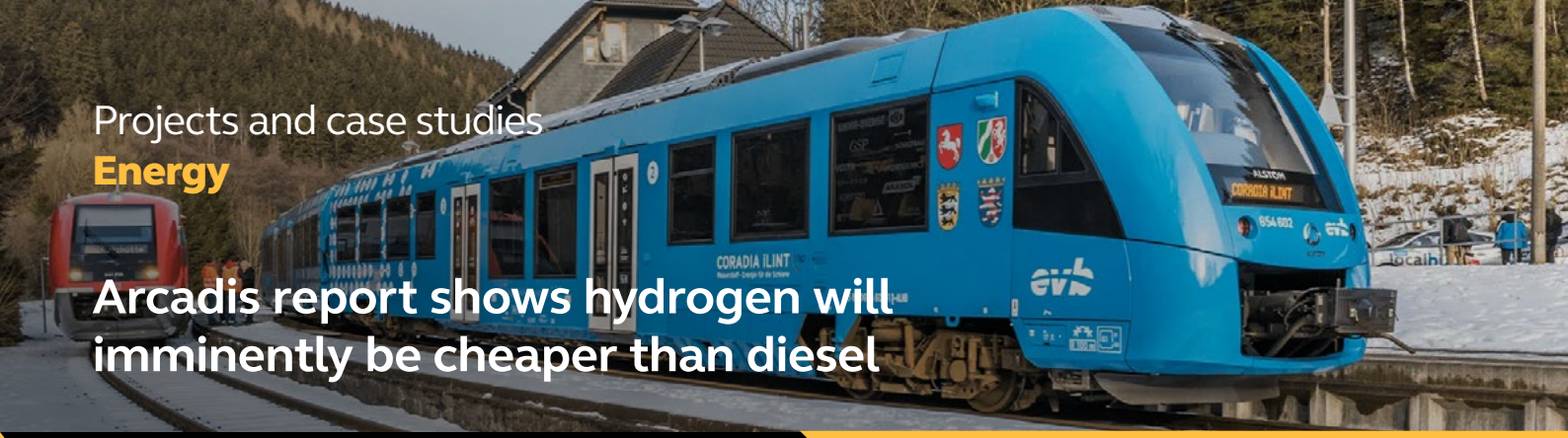


Projects and case studies
Energy

Arcadis report shows hydrogen will imminently be cheaper than diesel

Link: SMAHRT energy infrastructure for rail networks

Challenge:

The use of green hydrogen as a fuel source offers many benefits and provides a practical response to the global challenge of reducing dependency on fossil fuels. Funded by the Department for International Trade (DIT) and delivered through Innovate UK, Arcadis completed a study for Smart Ports working with industry partners CLARA Energy to assess the potential of applying UK technology to support the decarbonization of the Australian Inland Rail Project using hydrogen as a fuel source for freight railway operations.

The project sought to consider the decarbonization and environmental benefits offered using green hydrogen and to demonstrate the cost effectiveness of this operating model when compared with a traditional diesel-based model.

Solution:

Arcadis played a central role in connecting UK-based technology company Smart Ports with CLARA Energy, an Australian company committed to the generation of large-scale green hydrogen.

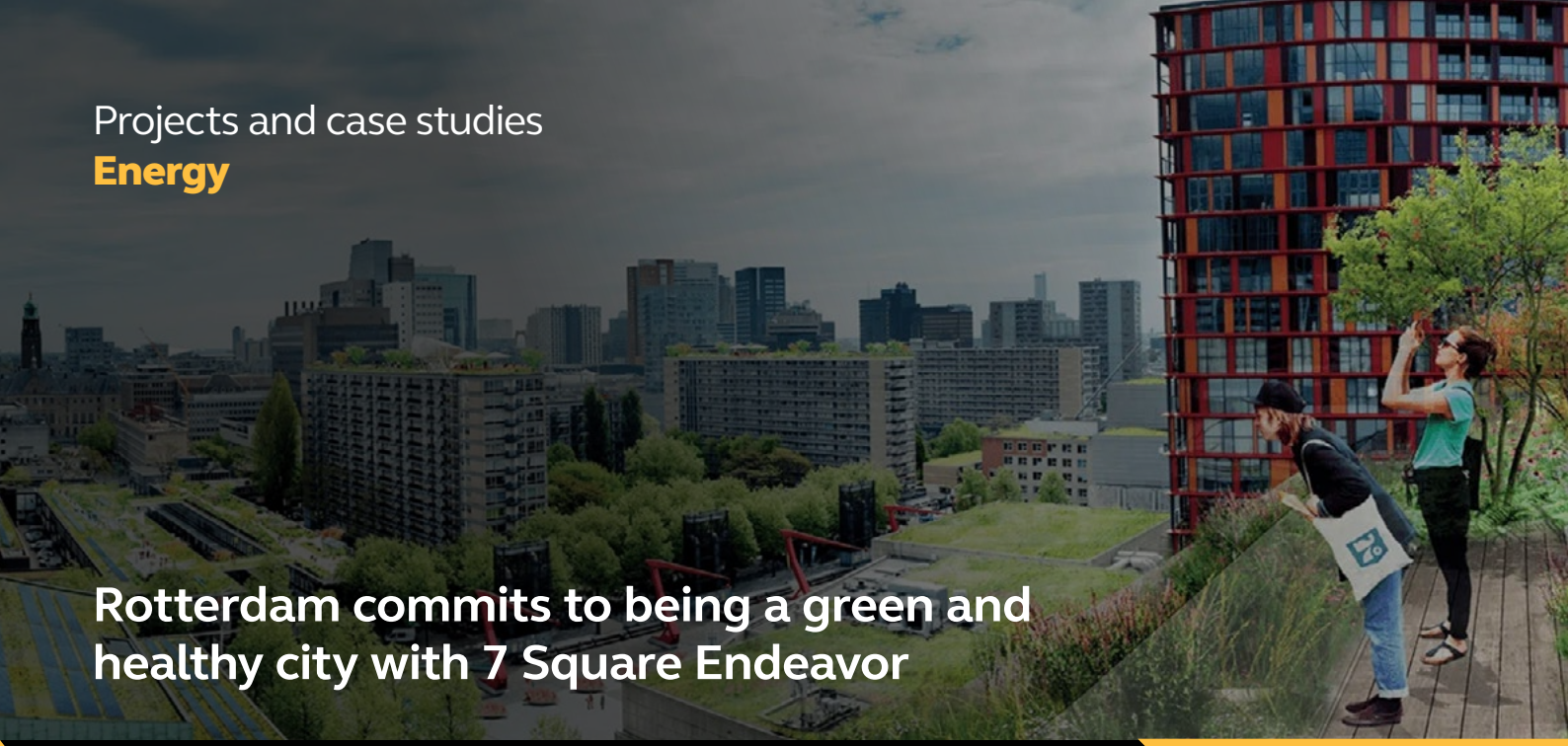
By suggesting to study the potential applications of this technology in decarbonizing the Australian Inland Rail Project—a 1700km freight line operating from Brisbane to Melbourne—the mutual needs and benefits of the respective clients could be investigated. Drawing on our global experience in railway infrastructure and hydrogen value chain, we provided technical specialization and a coordinated project management structure to facilitate and lead the UK government-funded technical study.

Impact:

The study demonstrated that ammonia can be used as a viable and cost-effective vector for storing and transporting hydrogen at scale to decarbonize railway operations. For the Inland Rail project alone, the use of hydrogen fuel as a source of power would translate to a saving of 763,00 tons of rail-related CO2 per year.

Additionally, given the level of investment and commitment in the use of renewable sources of energy in supporting governmental commitments to climate change action, the technology is expected to become increasingly more commonplace and cost effective to decarbonize our industries.

It was demonstrated that operating costs were comparable compared with current fossil fuel-based operations and anticipated to prove more cost effective over the next decade. This proves that while the technology is emerging, the opportunity for a sustainable, environmentally friendly, cost-effective means of decarbonizing the transport sector is available.



Rotterdam commits to being a green and healthy city with 7 Square Endeavor

Link: Sustainable Schouwburg Square Rotterdam: testing ground for climate-resilient cities

Challenge:

Rapid urbanization in Rotterdam has led to increasing pollution, heat stress and flooding rates over the years. The central neighborhood around Schouwburg Square has been in need of a sustainable facelift for a while. To address this, the Theater Rotterdam Schouwburg and De Doelen concert hall decided to join efforts and draw up a plan to make the area climate resilient.

Solution:

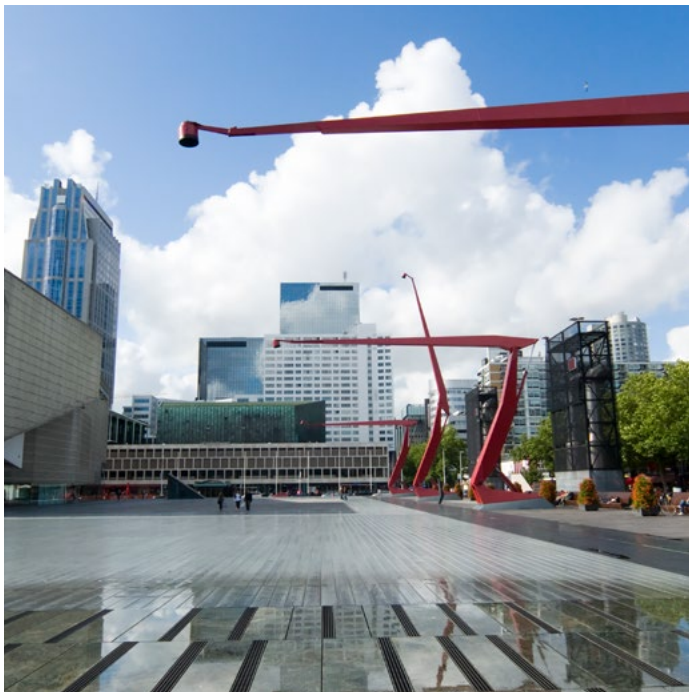
Together with Amvest Eneco, Dura Vermeer, the Municipality of Rotterdam, the Schieland and Krimpenerwaard Water Board, Theater Rotterdam and TNO, Arcadis set up a plan to make the area around the Schouwburg Square more sustainable, partnering across program management and communication efforts. The end goal is for the square to become climate neutral by 2030. The critical progress made here will serve as a testing ground for new innovative technologies, cyclical processes and business models that can potentially be carried forward in other parts of the city and country.

The scale of cooperation across all stakeholder groups and partners in this project has been unique. The ambition of 7 Square Endeavor is to link (existing) initiatives, knowledge, interests and expertise across all parties, and to work together to create new developments. Once the energy and water consumption analysis were completed, Arcadis worked with the area partners to develop a strategy with concrete targets for an energy-neutral and climate-adaptive square. This was achieved by mapping out buildings suitable for sustainable, multifunctional roofs with space for greenery, water storage, energy generation and accommodation.

In Rotterdam, many initiatives that address climate adaptation and energy transition through innovative solutions like these are being put to practice for the first time. This groundbreaking project is therefore very interesting for parties with similar ambitions.

Impact:

The program ensures that the area around Schouwburg Square will eventually be completely climate neutral. Among other things, transport, the environment, water supplies, urban planning and existing buildings will all benefit from the integrated energy management, cyclical processes and green-blue design, improving the quality of life for the community through better access to resources and green spaces. Solutions such as smart grids; the generation, storage and exchange of energy; grey water, green roofs and other innovative technologies will benefit all people who live, work and play in the city. The program will also provide economic benefits, such as lower energy costs through energy savings.



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Driving climate action through net-zero decarbonization planning

Link: Driving climate action through net zero decarbonization planning

Challenge:

Organizations around the world are making bold commitments to climate mitigation in response to growing pressure from investors, analysts, society and clients. However, it is not enough to simply commit to net-zero carbon; it requires a fundamental shift in the way organizations operate. An actionable, transparent and credible climate transition plan must follow. Yet less than 1% of the more than 18,600 companies disclosing to CDP, a non-profit platform for organizations to disclose environmental impacts and management, sufficiently responded to questions about their credible transition plan despite the proliferation of corporate net-zero targets.

Solution:

Our Sustainability Advisory experts from the US, UK, Netherlands and India are joining forces to develop Net Zero Catalyst, a decarbonization model that has the capability to translate our customers' climate goals into high-quality, actionable roadmaps to make their climate commitments a reality.

The software uses cost-benefit analysis and interactive data visualization to display decarbonization roadmaps at multiple scales. First, users enter details about their organization, including baseline greenhouse gas (GHG) emissions and the timing and ambition of their GHG reduction targets. Then, they can enter the cost, savings and potential carbon reduction of the measures they have evaluated or work with Arcadis experts to identify and assess measures. Users then score each measure based on a variety of qualitative impact metrics with custom weightings, such as biodiversity, health and safety and technical feasibility. For each measure, a variety of carbon and financial metrics are calculated, including marginal abatement cost, along with a qualitative impact score. These metrics are visualized in an interactive dashboard that can be used to prioritize decarbonization measures and build a roadmap for net zero.

The model underlying our Net Zero Catalyst tool was created through significant client consultation and informed by our legacy of working with sustainably minded organizations. Our work with HB Reavis is one example of the work informing the platform. HB Reavis wanted to showcase its commitment to climate action by setting a 2050 net zero target for its portfolio, supported by an actionable decarbonization plan. We helped HB Reavis develop a net zero program, including a decarbonization strategy, achievement plans, baseline emissions calculations and reporting, ensuring climate action is integrated across HB Reavis' business.

Another example is our work with a US-based rail operator who we are helping develop a comprehensive climate transition plan. We have conducted thorough physical and transition climate risk assessments, evaluated the integration of climate into Enterprise Risk Management procedures, and developed quantitative key performance indicators (KPIs) to measure success against public climate commitments.

As a part of this work, our team brought together more than 20 client stakeholders in a cross-functional workshop to identify and prioritize quantitative, verification-ready KPIs. This workshop helped stakeholders collectively think big and gain an appreciation for the role their individual functions would have in coming together to achieve the company's climate target.

Both examples informed the reporting metrics and sustainability ratings that will be available within Net Zero Catalyst to ensure the final model accurately portrays the cost and potential carbon reduction of decarbonization measures from an enterprise-level perspective.

By bringing together a variety of voices, we were able to adjust our model to adapt to our clients' climate goals and create roadmaps with tangible outcomes so that organizations can deliver on their promises by leveraging Net Zero Catalyst.

Impact:

Through Net Zero Catalyst, our clients can access a complete software offering that facilitates net zero planning needs and accelerates their journey to net zero. We work with clients to identify, evaluate and prioritize actionable decarbonization measures, and our results show GHG emissions reductions of 60-90% can be achieved with thorough planning. The tool also supports the development of strategies for our clients to source 100% renewable electricity. As a result, the net zero roadmaps that are developed in collaboration with our clients using Net Zero Catalyst satisfy voluntary and regulatory climate disclosure expectations and requirements, paving the way for a more sustainable future.

Projects and case studies
Energy

City of Antwerp aims to connect first building to sustainable heating network by 2030

Link: Antwerp district heating network program

Challenge:

About 90% of the City of Antwerp's heating requirements are currently met by fossil fuels such as oil and gas, which negatively impact the environment. This led the city to seek sustainable and affordable alternatives that will help it achieve its climate goals for 2050. Based on Antwerp's 'Climate Plan 2030', the city intends to accelerate its sustainability roadmap and achieve a 55% reduction in emissions compared with 2005 levels by 2030. One of the strategies the city is considering helping it meet its goals is the development of a sustainable district heating network powered by residual heat.

Solution:

The sustainable district heating network will transport residual heat from major industrial businesses to buildings in the city through an underground network. The aim is to connect the equivalent of 35,000 homes by 2030. With its proximity to the port, home to Europe's largest chemical cluster, Antwerp is perfectly placed to roll out the district heating network on a massive scale. A project of this magnitude is truly a first for Belgium.

Arcadis Belgium, Arcadis Netherlands and AKD took on the coordinating role in 2020. Together, we explored how large parts of the city can be provided with a district heating network. This involved challenges such as determining the best location to install such a network, which types of buildings will or will not be connected, and which market model and policies are used to regulate access to the network. In our capacity as advisors, we drew up a 'Roadmap 2030' for the implementation of this complex district heating network program and provided technical and legal expertise for the city.

Where will these heat networks be located?
And how will they be rolled out?

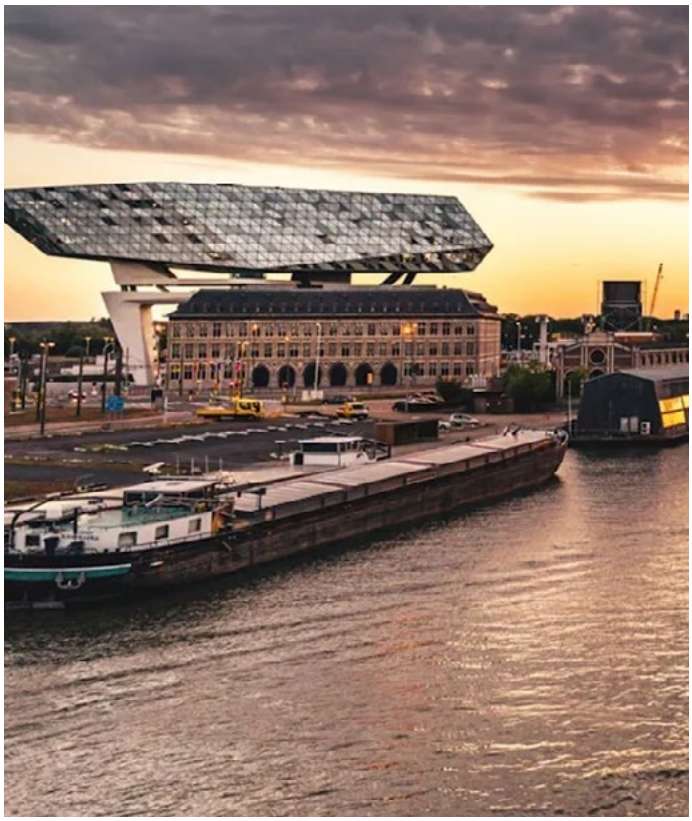
The City of Antwerp has identified five heat clusters to install the first heating networks by 2030. In Antwerp North, the so-called 'backbone' from the waste incineration plant of Indaver is already in place, and practical preparations are being made to supply heat to the neighborhoods of Luithagen, Luchtbal and Rozemaai.

In preparation for the installation of district heating networks, careful planning was undertaken to align with significant upcoming infrastructure projects. For example, along the ring road in Antwerp, designated reservation strips were set aside for a heat transport connection.

Aside from our work on the heat clusters, we are also working with our partners to create a framework for a district heating network that will serve the entire City of Antwerp. The policy must clarify who can use the heat, what the conditions are and how new projects could link up with the heating network in the future. Initially, these users will mainly be large buildings such as schools, apartment blocks, businesses, and hospitals

Impact:

This sustainable city-wide district heating network will cover 10% of Antwerp's heating requirements by 2030, laying the foundation to be climate-neutral by 2050. To turn this vision into a reality, we need to start thinking now about how heating demands and other planned infrastructure projects will evolve in the future. Utilizing residual heat, this district heating network enhances energy security and promotes more stable prices. Antwerp's district heating network will serve as a model for other cities aiming to achieve their goals of climate neutrality.



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Arcadis and ILF to lead planning for Rhein-Main-Link energy route, driving Germany's energy transition

Link: Arcadis leads planning for Rhein-Main-Link energy route

Challenge:

A consortium comprising Arcadis and ILF Beratende Ingenieure GmbH, two of the leading global planning and consulting companies, has been commissioned by the Germany transmission system operator Amprion to undertake the initial conceptual phases of route planning for the 500km long Rhein-Main-Link energy route; one of Germany's key grid expansion projects aiming to supply the country with climate-neutral energy by 2045.

The energy transition in Germany requires powerful supra-regional direct current links for the distribution of electricity from renewable sources. The Rhein-Main-Link is an underground cable connection that will transport electricity from offshore wind farms in the North Sea to the Rhein-Main region. With strong local industry and 5.8 million inhabitants, the Rhein-Main metropolitan region is a major energy consumer with particularly high network requirements. As such, the Rhein-Main Link combines four links proposed in the 2037/2045 Electricity Network Development Plan into one project and is designed to meet the strong growth in energy demand in the Rhein-Main metropolitan region in the coming years.

Solution:

The Arcadis/ILF consortium will support grid operator Amprion with a technical planning review and route planning services for the Federal Network Agency's preliminary preference area, with a view to the submission of a planning application and documents in line with sections 19 and 21 of the German Grid Expansion Acceleration Act (NABEG). This aims to simplify and reduce the time required for planning and approval of grid expansion projects.

The draft of the 2037/2045 Electricity Grid Development Plan—published by Germany's four transmission system operators; 50Hertz, Amprion, TenneT and TransnetBW—evisages four direct current links in one route for this project. This will bring a combined wind energy output of around eight gigawatts from the North Sea to southern Hesse.

The total investment for the four links is estimated at several billion euros. Completion of the application for planning approval is scheduled for June 2024, with final route planning in March 2028. The first link to the Rhein-Main region is scheduled to go into operation in 2033.

Initiatives

Energy Transition Academy

Our world stands at a crucial juncture, where the urgency to address climate challenges with innovative, sustainable solutions has never been greater. Arcadis is committed to driving the energy transition, supporting our clients' decarbonization goals and shaping a better world for future generations.

Embracing a transition to cleaner, greener energy sources is a key part of this puzzle, and together, we are focused on accelerating this transformation. Arcadis' Energy Transition Academy, now powered by the Lovinklaan Foundation, was initially launched in June 2023, to open exciting opportunities for us to future-proof our capabilities and build capacity in this critical area. We have got a lofty goal of growing to over 2,500+ energy transition professionals within just three years and are confident that the Arcadis Energy Transition Academy can get us there.

Future-proofed capabilities

Connecting client needs

Considering client input around critical needs

With advice and participation from senior-level practitioners

Upskilling teams

Upskilling existing teams to support the energy transition

Arcadians looking to develop competencies in energy transition

Upscaling capability

Partnering with global universities to build a pipeline of energy transition capabilities

And with clients and academia to build capability in future market growth areas

Focus on Capabilities

Growing to over **2,500+** energy transition professionals by 2027; building future-proof skills to develop the next generation of experts

Projects and case studies

Sustainable Transportation

Supporting Transport for the North with its decarbonization strategy

Link: Transport for the North's decarbonization strategy

Challenge:

Decarbonizing transportation is an ambition and a challenge for many regions and local areas. The ambition comes from national and regional policies, the desire to act on climate change, and to take advantage of the economic progress that can flow from these activities. The challenge lies in managing the sometimes-competing policy demands and funding priorities within economic cycles.

Currently, transportation accounts for the largest share of carbon emissions in the UK, and as such, all sectors are dependent on the speed at which we decarbonize our approach to mobility. With this mighty task at hand, we're supporting Transport for the North (TfN) in identifying how to ensure clean growth opportunities in the region while contemplating the various policy hurdles.

Solution:

TfN's vision is to provide a thriving North of England where world-class transport supports sustainable economic growth, excellent quality of life and improved opportunities for all. Investment in pan-northern strategic transport improvements will increase productivity, create jobs and enhance the overall impact of the Northern Powerhouse on the UK economy. A key challenge is to facilitate this growth in a sustainable and equitable manner.

That's why the organization is developing a decarbonization strategy to set out a pan-northern trajectory to achieve an accelerated path to net-zero. But it's not a straightforward task when there is no centralized or consistent approach for developing and storing information on the multiple regions and LEPs that make up the North, as well as the multiple national policies that influence them.

We're bringing clarity to this process and supporting the strategy by working on a 'gap analysis' to identify the key actions that TfN can take to ensure the clean growth benefits of rapid transport sector decarbonization are well understood and support the acceleration of the transition.

We're looking at clean growth opportunities to develop recommendations and actions that will support TfN's decarbonization agenda, including low-emission vehicles, hydrogen, freight transport logistical improvements, rail decarbonization, a shift to active travel and better public transport. This will be achieved by working with key stakeholders, including Highways England, Network Rail and HS2.

Impact:

Any new decarbonization strategy needs to be able to draw on knowledge and understanding of not only current policy but also incorporate the ability to look ahead and assess the trends—globally, nationally and locally—that will drive tomorrow's policy and funding opportunities.

With our research and development of the gap analysis, TfN has clear action points that it can now take forward as recommendations to central government with clarity and have confidence in the knowledge that these clean growth strategies have identified the right gaps through our inside out approach and are future-proofed.

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Estee Lauder Companies (ELC) global fleet decarbonization

Challenge:

ELC's global fleet is approximately 2,200 vehicles operating in six regions, including North America, Latin America (LATAM), Europe Middle East Africa (EMEA), UK and Ireland (UK&I) and Asia Pacific (APAC). The company needs a global fleet transition toolkit adaptable to each of the six regions where they operate, as they are subject to different market forces, EV fleet and charging infrastructure maturity, as well as different taxation rules, regulations and government incentives.

Solution:

Arcadis was asked to develop an EV Fleet Transition toolkit that each business region will use to switch its existing fleet to electric vehicles. Our team continues to support ELC with change management and fleet transition planning, including:

- Regional EV Benchmarking
- Review of Current Fleet—Conduct Landscape Analysis
- Develop an EV Transition Toolkit
- Cost Benefit Analysis of Fleet Alternatives—Green Fleet Management
- EV Financial Incentives
- Engaging Employees in Electrification
- EV Driver Survey and Tool

Impact:

ELC's transition of its corporate fleet to 100% electric will greatly contribute toward reducing the company's Scope 1 greenhouse gas (GHG) emissions and progress toward ELC's 2030 science-based targets for sustainability. Electrification will benefit numerous stakeholders globally, including drivers and residents near depots and main thoroughfares.

In addition, ELC's commitment to fleet electrification sends a strong market signal that there is demand for EVs from the business community. ELC recently became the first prestige beauty company to join The Climate Group's EV100 initiative, a coalition of global companies committed to 100% electrification of their fleets by 2030.

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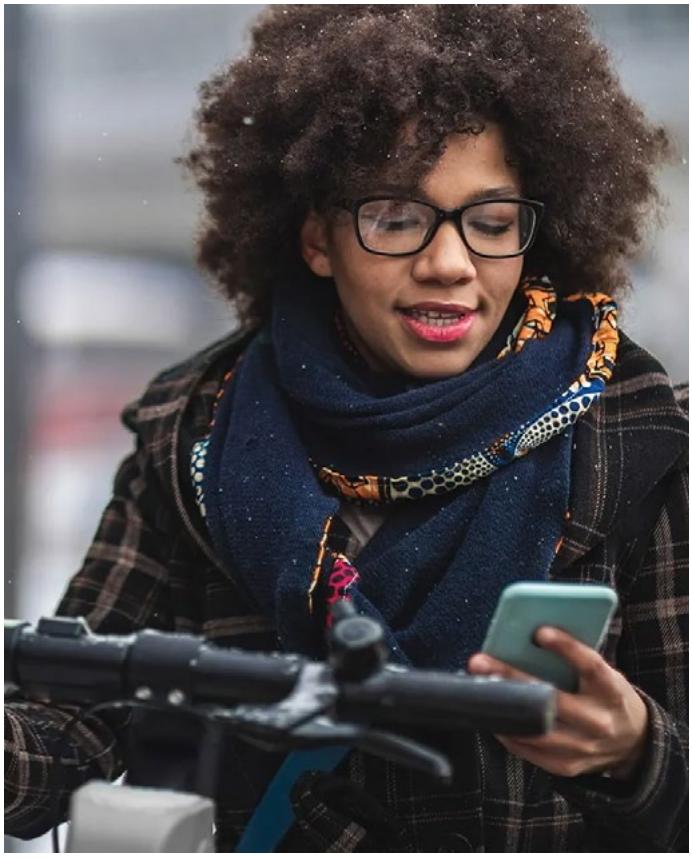
Bumble and bumble
MAC
MICHAEL KORS
CLINIQUE
TOM FORD BEAUTY
BOBBI BROWN



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Projects and case studies
Sustainable Transportation

Implementing green public transit infrastructure for a sustainable, efficient future

Link: GoRaleigh fleet electrification pilot

Challenge:

In 2019, Raleigh's City Council established a goal of reducing community-wide greenhouse gas (GHG) emissions by 80% by 2050. Given that almost half of the city's total GHG emissions come from transportation, the GoRaleigh public transit system is working toward meeting the city's goal of reducing GHG emissions by transitioning its entire fleet of 115 buses made up of 80% renewable compressed natural gas (CNG) buses and 20% battery-electric buses (BEB). So far, since 2019, Arcadis has supported GoRaleigh's deployment of 71 CNG buses and the start of a pilot in 2022 with five BEBs.

Solution:

Our planning, design and deployment services supported the GoRaleigh Transit Fleet Electrification Pilot. We upgraded the transit system's existing operating facility infrastructure to add onsite charging for the pilot's battery-electric buses while maintaining its capacity to support the fleet's other buses. During the assessment phase, our experts considered the facility's limitations, details of the bus service and charging requirements for GoRaleigh's service blocks using our sophisticated SparkFleet BEB energy usage modeling software.

The BEB charging infrastructure, utility grid connection upgrades and charging management system were all designed to support the pilot buses and serve as the foundation for future expansion to support an increasingly larger zero-emission bus fleet. Following approval of our design plans, we provided management services that supported the procurement, installation and testing of the BEB chargers, their supporting electrical infrastructure and the charging management system.

In 2018, Arcadis participated in the initial stage of the transition away from diesel buses by designing a new CNG fuel station to accommodate adding CNG buses to the fleet. These are now serving as bridge technology during the incremental transition toward a fleet fully comprised of CNG buses and zero-emission BEBs. Our design services in this earlier fleet transition stage also included fuel management system integration, building automation controls, data communications with the city's network and coordination with utility providers.

Impact:

Sustainability is a cornerstone of Raleigh's vision for the future, with alternative-fueled vehicles helping the city make substantial steps in reducing its GHG emissions.

Now completely operational, the pilot provided initial hardware and software infrastructure that has enabled the BEB component for the ongoing GoRaleigh fleet transition. The pilot will contribute to the city's goal of reducing community-wide GHG emissions by 80% by 2050.

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Projects and case studies

Sustainable Transportation

Arcadis report shows hydrogen will imminently be cheaper than diesel

Link: SMAHRT energy infrastructure for rail networks

Challenge:

The use of green hydrogen as a fuel source offers many benefits and provides a practical response to the global challenge of reducing dependency on fossil fuels. Funded by the Department for International Trade (DIT) and delivered through Innovate UK, Arcadis completed a study for Smart Ports working with industry partners CLARA Energy to assess the potential of applying UK technology to support the decarbonization of the Australian Inland Rail Project using hydrogen as a fuel source for freight railway operations.

The project sought to consider the decarbonization and environmental benefits offered using green hydrogen and to demonstrate the cost effectiveness of this operating model when compared with a traditional diesel-based model.

Solution:

Arcadis played a central role in connecting UK-based technology company Smart Ports with CLARA Energy, an Australian company committed to the generation of large-scale green hydrogen.

By suggesting studying the potential applications of this technology in decarbonizing the Australian Inland Rail Project—a 1700km freight line operating from Brisbane to Melbourne—the mutual needs and benefits of the respective clients could be investigated. Drawing on our global experience in railway infrastructure and hydrogen value chain, we provided technical specialization and a coordinated project management structure to facilitate and lead the UK government-funded technical study.

Impact:

The study demonstrated that ammonia can be used as a viable and cost-effective vector for storing and transporting hydrogen at scale to decarbonize railway operations. For the Inland Rail project alone, the use of hydrogen fuel as a source of power would translate to a saving of 763,00 tons of rail-related CO2 per year.

Additionally, given the level of investment and commitment in the use of renewable sources of energy in supporting governmental commitments to climate change action, the technology is expected to become increasingly more commonplace and cost effective to decarbonize our industries.

It was demonstrated that operating costs were comparable compared with current fossil fuel-based operations and anticipated to prove more cost effective over the next decade. This proves that while the technology is emerging, the opportunity for a sustainable, environmentally friendly, cost-effective means of decarbonizing the transport sector is available.

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Converting fleet to battery electric bus (BEB) operations to help meet zero-emissions goals

Link: Converting fleet to battery electric bus operations

Challenge:

More states are targeting zero-emissions goals by electrifying public transit fleets. Battery electric buses (BEBs) are four times more fuel-efficient than buses that run on diesel or compressed natural gas, and they hold the potential for lowering long-term operations and maintenance costs.

One statewide transit agency wanted to use BEBs to protect riders and residents, especially those in communities disproportionately affected by climate change, from vehicle pollution. But early talks raised more questions than answers. With more than 400 buses and four large garages to account for, the agency needed a data-driven dive into different BEB conversion scenarios to build an effective plan.

Solution:

Our feasibility analysis investigated conversions from every angle, with considerations for full and partial electrification. It simulated bus routes and garage operations to consider how BEBs might be affected by weather, route design, driver behavior, peak hour conditions and in-route charging needs. Coordination with BEB manufacturers allowed the team to determine realistic expectations for battery performance under worst-case scenarios. Insights from manufacturers also formed the basis of intelligent bus monitoring, bus procurement and performance-tracking strategies for the BEB program.

The collection of findings allowed the agency to prioritize routes to be electrified. Then, an electric load analysis showed how usage and rates for those routes would vary based on different levels of BEB implementation. Space and implementation analysis based on current operations informed the structural, civil and electrical design updates needed within the garages.

Cost-effectiveness would be crucial to sustaining the program through the agency's long-term goal: 100% zero emissions. Since BEBs require unique maintenance and equipment needs to account for, our experts assisted with cost estimating and phasing plans to help the agency optimize capital planning.

Impact:

With the feasibility studies complete, the agency has its foundation for bus electrification. The phased approach will initially prioritize zero-emission bus use in areas that bore the brunt of climate impacts from the transportation sector, with a goal for a 100% zero-emissions fleet by 2040. Riders and residents will breathe easier knowing the zero-emissions fleet will drastically reduce greenhouse gas emissions and modernize a crucial link in the mobility network.

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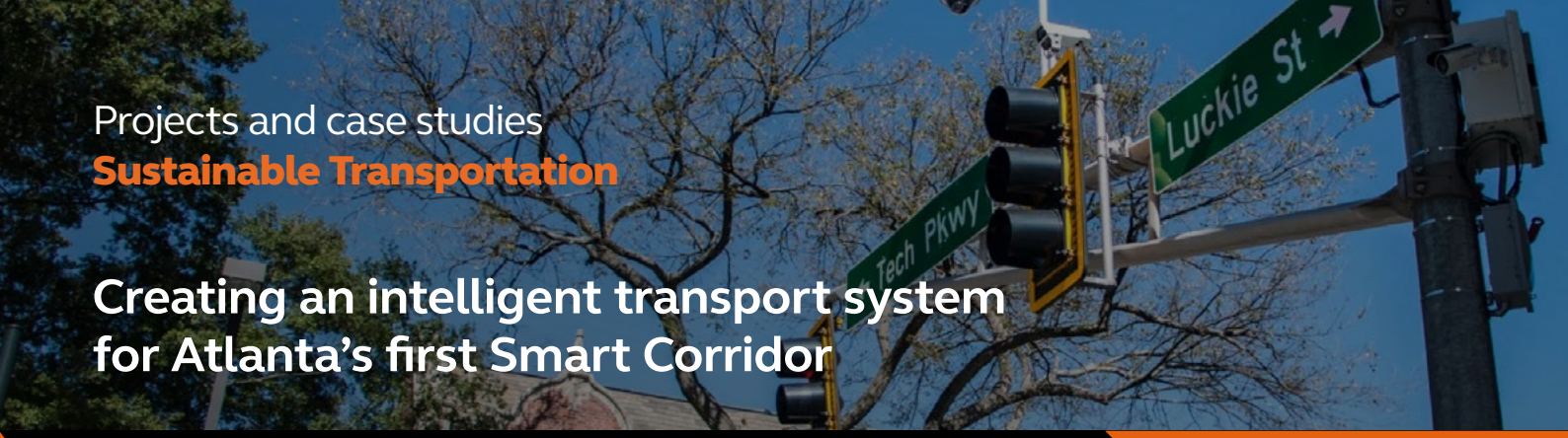


Projects and case studies
Sustainable Transportation

Creating an intelligent transport system for Atlanta's first Smart Corridor

Link: Creating an Intelligent Transportation System for Atlanta's first Smart Corridor

Challenge:

Well before it became a Smart Corridor, North Avenue was familiar to many Atlantans. Its connections to business, education and transit hubs kept it buzzing with activity. But the constant flow of drivers, cyclists and pedestrians made it a hotspot for collisions and heavy emissions outputs.

City leaders hoped digital solutions could make the area safer and more efficient. As part of its Renew Atlanta initiative, the city turned North Avenue into The North Avenue Smart Corridor—a "living lab" to test technology-driven solutions for safe, efficient and environmentally friendly mobility.

Solution:

Connectivity would be essential to gathering data and making enhancements to the real-world traffic network. Arcadians designed an Intelligent Transportation System (ITS) that would allow various third-party technologies to communicate seamlessly.

The result: a digitized traffic ecosystem that can sense and adapt. A network of hundreds of Internet of Things sensors across 26 signalized intersections combines artificial intelligence with traffic theory to improve the flow of transit and protect travelers.

Advanced video detection systems and vehicle-to-infrastructure communications track traffic statistics such as speed and volume. The network can identify modes of travel, allowing bicyclists and pedestrians to safely traverse crosswalks without pushing a button. When an emergency arises, it prioritizes the fire engines and ambulances responding to calls. Similarly, the system can accommodate special traffic patterns used for events like the Super Bowl, which the city hosted in 2019.

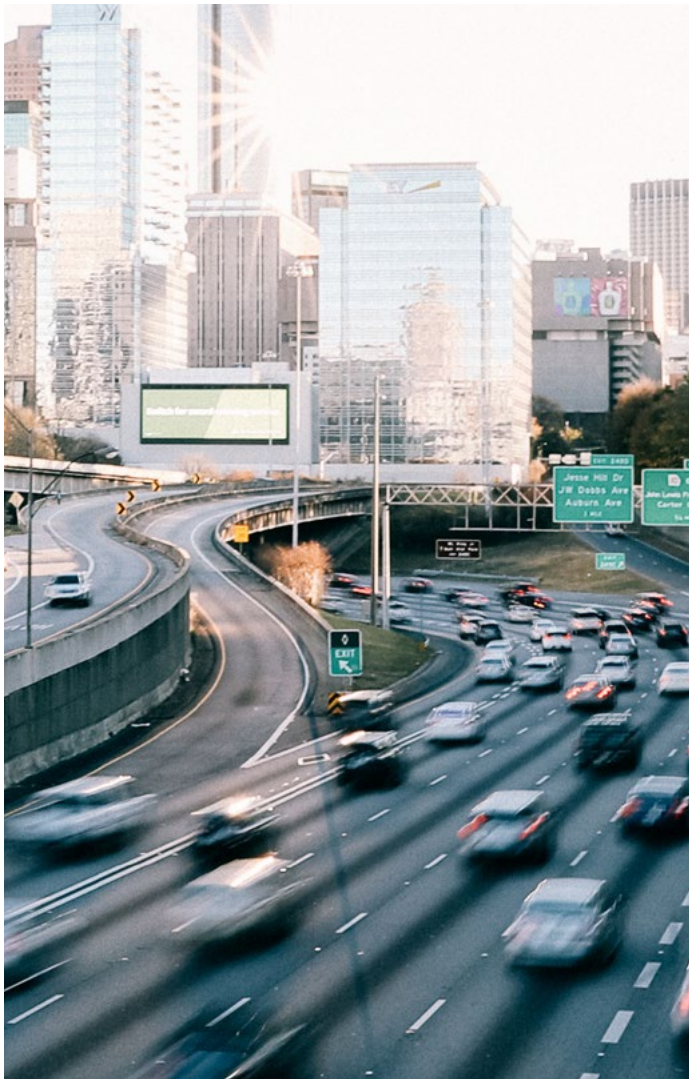
All activity along the corridor is monitored from a digital mobility center installed and maintained by Arcadians. There, team members—including experts from the Georgia Institute of Technology and the Georgia Department of Transportation—continually observe the network and test potential improvements.

To enhance the value of the data the ITS collects, the team released a free app for drivers, cyclists and pedestrians to use along the corridor. It shares helpful traffic information, such as signal timing, and alerts users to impending hazards, like an approaching vehicle that is traveling above the speed limit.

Impact:

Progress regarding safety has been remarkable, with accidents down 20-35% along different sections of the corridor. The new system also consumes less energy than before, supporting the team's mission to improve the environment along with mobility and safety.

The safer, more efficient journeys on North Avenue might only be the beginning. City leaders hope the North Avenue Smart Corridor will serve as a platform for 'smart city' efforts around Atlanta, where data unlocks better solutions for citizens.



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Projects and case studies

Sustainable Transportation

Providing Angelenos with greater connectivity to transit throughout LA county

Link: Providing Angelenos with greater connectivity to transit throughout LA county

Challenge:

For decades, Los Angeles has been notorious for being one of the most congested cities in the world, yet because of long wait times and multiple transfers, LA citizens historically opt for single-passenger vehicle trips, contributing to traffic that creates congestion and environmental impacts that threaten long-term sustainability.

To create an efficient, equitable and sustainable mass transit option for Angelenos, LA Metro developed the Regional Connector, a new, 1.9-mile underground light-rail extension that provides riders with a convenient and seamless journey to the business, education and cultural hubs that help LA thrive.

To make this historic project a reality, LA Metro selected Arcadis to manage the construction of the tunnel and the light rail's new home beneath the downtown area—safely and without disturbing existing buildings or disrupting LA's bustling business district.

Solution:

The ten-year-long construction of this project included the excavation of over 6,000 feet of two 21-foot-diameter tunnels and three 350-foot-long underground stations, the Little Tokyo/Arts District station, Historic Broadway station and Grand Avenue Arts/Bunker Hill Station, which comprise the Regional Connector.

Throughout this project, Arcadis worked with many stakeholders and community-based organizations to understand community needs and determine a plan that worked for all. As the team assessed the underground conditions for the tunnels and stations, they also considered the approaches to work in the areas surrounding the stations—for example, reducing noise and vibration near the Walt Disney Concert Hall, or maintaining restaurant and shopping access near Little Tokyo—to determine the best approach for each.

The team used a cut-and-cover approach, digging a large trench that was covered with temporary concrete decking to maintain vehicle traffic on the surface while the Little Tokyo/Arts District and Historic Broadway stations were being constructed. This approach protected local utilities and allowed the team to excavate space for the new station beneath them, while Angelenos continued to travel safely above. For the Historic Broadway station, sequential excavation method mining (SEM) was used to complete a mined crossover cavern. SEM was chosen because it allowed for the use of excavation to proceed without causing surface disruptions to traffic, utilities or facilities.

The team also utilized digital solutions, such as a digital traffic model, during planning to understand traffic patterns and help mitigate disruption during construction. Using this model, they were able to visualize how construction would impact the traffic flow along Flower Street, a key artery for downtown Los Angeles, and make adjustments to limit traffic impacts during construction.

Impact:

The completed Regional Connector is now open to the public and has transformed the way residents and visitors travel throughout LA. The new system provides more convenient and equitable access to LA's rich cultural landscape, including eight permanent artworks commissioned through the Metro Art program which adorn each of the new stations.

LA Metro also expects the system to bring in up to 17,000 additional trips each day, taking thousands of cars off the road, which will improve congestion and reduce emissions outputs.

Helping to reduce the environmental impact of a large transportation and logistics company

Link: Helping to reduce the environmental impact of a large transportation and logistics company

Challenge:

Freight transportation plays a crucial role in the U.S. economy, as 55 million tons of goods move around the country every day, according to the Federal Highway Administration. Millions of consumers and virtually every industry, from medical to manufacturing, rely heavily on freight transportation for the shipment of products and supplies—but while it is a critical component of our supply chain, it's also a top contributor of greenhouse gas emissions.

Though consumers and the freight sector itself have begun to prioritize decarbonization, transportation and logistics, providers face several barriers to doing so. In fact, a 2014 study by the Sustainable Development Solution Network named freight transport as one of the most difficult sectors to decarbonize. Despite this challenge, J.B. Hunt understands that its stakeholders expect meaningful reductions in greenhouse gas (GHG) emissions and has partnered with Arcadis to accelerate their sustainability ambitions.

Solution:

In 2019, J.B. Hunt engaged Arcadis to help develop their sustainability program, advise on important public climate disclosures and ensure their ability to meet customer, investor and employee expectations.

Arcadis supported in calculating the company's annual GHG emissions inventory; producing the company's first annual sustainability report in 2020; preparing environmental, social and corporate governance (ESG) disclosures; developing ambitious science based GHG reduction targets; and recommending opportunities to increase renewable energy development. This process also included a materiality assessment, questionnaire responses and reviews for sustainability ratings agencies such as CDP, S&P Global and EcoVadis, as well both physical risk and climate risk scenario analyses.

As a result of the climate scenario analysis, Arcadis identified shifting from trucking to intermodal shipping—prioritizing trains for domestic shipping instead of diesel-powered freight trucks—as a key opportunity for J.B. Hunt as it prepares for a shift toward a low-carbon economy. Intermodal shipping is a much cleaner option compared to other transport modes and is already a key component of J.B. Hunt's business model. Leveraging this strength would allow the company to expand intermodal shipping options for customers looking to reduce their Scope 3 transport emissions.

Impact:

Arcadis' support has enabled J.B. Hunt to establish a robust sustainability program and make credible progress in the reduction of fossil-based fuels while evaluating business opportunities, like increased intermodal shipping, that prevent harm to the environment. As one of the largest supply chain solutions providers in North America, J.B. Hunt is helping advance the transportation industry's progress by developing sustainable solutions that are commercially viable and scalable for widespread adoption, reducing the industry's environmental impact in a lasting way.

Network Rail Carbon Baselining

Challenge:

Arcadis was commissioned to establish an embodied carbon baseline for Network Rail's UK-wide supply chain operations (SCO). This involved a total of 85 sites across the UK, covering 10,000 products across track, sleeper, aggregates, switches and crossing product and asset categories, and bringing insight and recommendations to improve Network Rail SCO carbon data management systems, processes and performance reporting.

Solution:

Arcadis produced an embodied carbon baseline for all products and materials procured for Network Rail over a 12-month period—delivering dynamic reporting and recommendations for data management improvements to decarbonization.

Our team combined an array of skills, including digital data management capabilities, as well as experience in major project decarbonization and application of PAS2080 carbon management in infrastructure standards. The team's key first step was to access, gather and validate materials and product data from over 30 Network Rail data point contacts (DPCs).

Given the wide range of materials and products assessed across the SCO portfolio, our team utilized several emissions assessment tools, including the One Click LCA, RSSB Rail Carbon Tool and validated Environmental Product Declarations (EPDs). Applying these tools produced embodied carbon results data across the lifecycle stages, from material production to transportation and placement of material around the rail network.

Impact:

Arcadis delivered a comprehensive Embodied Carbon Baseline Report and Power BI dashboard. Our data skills, rail sector and carbon knowledge enabled us to assess all 85 sites and 10,000 products while presenting this in a single dashboard to visualize and illustrate carbon drivers, hotspots and opportunities.

We also produced an open-source dataset to enable Network Rail to monitor carbon reduction performance on an ongoing basis in a systematic and structured manner. Arcadis recommended a series of carbon data management improvements, including leveraging and integrating with existing datasets.

Elevated bridges over the Albert Canal promote sustainable freight transport

Link: Upgrading the Albert Canal in Belgium

Challenge:

The Albert Canal transports nearly 40 million goods annually and is the main inland waterway in Flanders. Moreover, transportation by water is more sustainable than by road. However, the current limitation in clearance height and width under bridges restricts the number of container layers that a cargo ship can carry. Therefore, The Flemish Waterway invested in the main growth bottleneck of Flemish inland navigation.

Solution:

In collaboration with Sweco, Arcadis supported The Flemish Waterway in raising several bridges over the Albert Canal to a height of 9.10 meters above the canal level. This elevation allows ships to transport up to four layers of containers, increasing capacity by 25%.

For 31 bridges, we assisted The Flemish Waterway in the study, tendering and execution of the works. We also implemented measures to minimize disruption, such as planning work phases, setting up detours and efficiently organizing traffic.

Out of the 31 bridges, 15 were rebuilt through a PPP-DBFM approach. This involved a public-private partnership agreement that included design, construction, financing and 30-year maintenance. We developed the assignment and details, and then monitored the process of the public-private partnership during the execution.

The remaining 16 bridges were tendered in the usual manner. We conducted concept and stability studies, defined the assignment, and supported The Flemish Waterway in obtaining the necessary permits.

Impact:

One ship of 1200 tons replaces 50 trucks. This means that 8,000 trucks stay out of traffic jams every day, resulting in 2 million fewer trucks annually. By raising and widening the bridges over the Albert Canal, ships can now transport up to four layers of containers. This not only boosts our inland navigation and economy but also relieves our roads from heavy traffic.

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Supporting Shell's world-first transition from fuel station to EV charging hub

Link: Supporting Shell's world first transition from fuel station to EV charging hub

Challenge:

Electric vehicle (EV) drivers are looking for a charging experience that is as fast, convenient and comfortable as possible. So, when it was time to transform Shell's Service Station in Fulham in the UK into an EV charging hub, Arcadis stepped in to support the removal of existing fuel infrastructure and the environmental planning, to pave the way for the best solutions for EV drivers.

Solution:

The result is Shell's first-ever site to have converted from selling petrol and diesel to cater solely to electric vehicles, offering a glimpse into the future of mobility. Shell Fulham now features nine high-powered, ultra-rapid 175kW charge points. EV and battery technology is advancing rapidly, and we hope that in the future EV drivers will be able to charge even faster using these 175kW chargers. Today, the charging speed is limited by the EV batteries and a 175 kW charger will charge most vehicles up to 80% within 30 minutes in ideal conditions. Actual charging speeds may vary based on the state of the battery and ambient temperature. (These figures are based on an initial state of charge of the battery of 20%).

Shell Fulham features a sustainable design including a timber canopy with built-in solar panels, as well as roof and shop windows that employ double glazing with high insulating properties. Like all of Shell's EV chargers in the UK, including those at over 100 Shell forecourts, the chargers at Shell Fulham run on 100% certified renewable electricity. The hub includes a comfortable seating area, free Wi-Fi, a Costa Coffee Cafe and an extensive Little Waitrose & Partners.

Arcadis has supported the safe removal of the old petrol and diesel infrastructure at the existing fuel station and are continuing to work with Hammersmith and Fulham Council in formally closing the remaining environmental aspects of the planning process.

Impact:

With the help of our consultants, the site opened on schedule in January 2022 by MP for Chelsea and Fulham and Minister for Energy, Clean Growth and Climate Change, Greg Hands.

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Taking the transportation sector to new heights in San Diego

Link: Taking the transportation sector to new heights in San Diego

Challenge:

Advanced Air Mobility (AAM) is the latest new mobility solution revolutionizing the transport sector. This innovative and evolving technology can transform mobility services and bring social and environmental benefits to the community.

The San Diego Association of Governments (SANDAG) is preparing for AAM services in the San Diego region, developing a regional strategy to integrate AAM services as regulations evolve.

AAM has the potential to not only alter, but also augment the transportation system. In a city like San Diego, the availability of AAM would mean a faster, cheaper, cleaner way of delivering goods, getting around and providing emergency services.

However, to become a commercially viable option for commuters, AAM must first be integrated into the already complex network of mobility options and emerging technologies in the region. Furthermore, a key challenge in San Diego is the unique airspace operating environment and the geography. At the same time, the service must meet regulatory compliance as government policies are created and come into effect.

Solution:

A team from Arcadis with expertise across aviation, mobility, stakeholder engagement and environmental advisory are leading the consortium of VHB, Hovecon, Sutra Research and TTG Environmental, to develop SANDAG's Regional AAM implementation strategy, to integrate AAM services in the region as regulations evolve. This will be the first of many regional strategies to be developed around the country as cities prepare for this new and evolving solution.

The team is assessing AAM research, policies and market analyses, and leading a comprehensive public outreach and education strategy to meet the needs of underserved communities. We are also incorporating our digital expertise and platforms, using our Smart Atlas GIS Platform to capture data from multiple sources and inform the AAM strategy with data-led decision-making.

Impact:

Widely accessible aircraft that revolutionize the movement of people, goods and services could be a reality within the next few years. Using innovative and evolving technology, AAM is on the verge of becoming a groundbreaking mode of low carbon transportation that complements conventional transportation systems. If implemented correctly and integrated with other modes of transport, AAM can make mobility more equitable and accessible across the US.

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Future-proofing Utrecht's cycling network

Challenge:

The Province of Utrecht has the ambition to become the cycling capital of Europe. As part of this, Utrecht asked Arcadis to develop its Regional Cycling Strategy as input to the National Cycling Strategy. Moreover, to be able to facilitate the growing number of cyclists with increasing speed (e.g., users of e-bikes and speedpedelecs), the province asked Arcadis also to investigate how to upgrade its 40 high-priority cycleways.

The strategy focuses on three main themes: a high-quality regional cycling highway network, upgrading the bicycle parking facilities at transit stations and city centers, and behavioral change campaigns. The underlying aim is to upgrade cycling as an equal mode of transport to motorized traffic and public transport, especially on trips shorter than 15 km.

Solution:

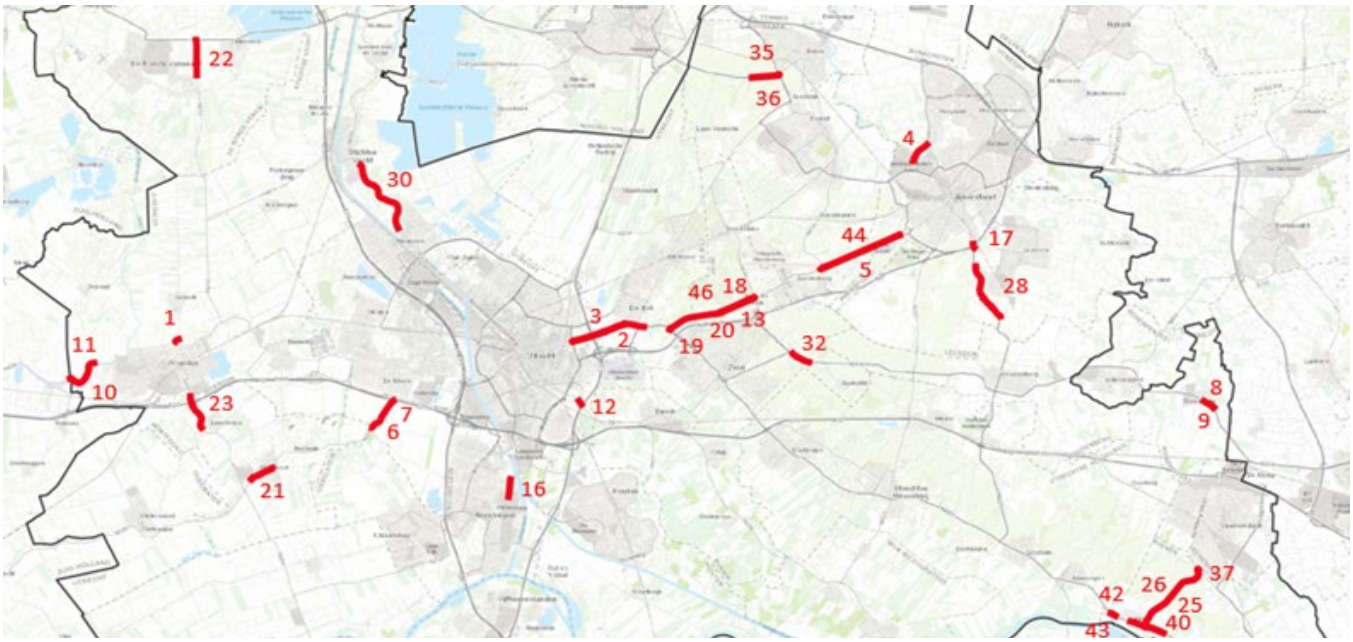
Arcadis led the development of the Regional Cycling Strategy that was co-produced with the Province of Utrecht, and this included a vision for the future cycling highway network in the area. The integrated approach, containing a strategy on cycling infrastructure, behavior change programs and improving intermodal connectivity by upgrading bike parking, aimed to increase the effectiveness of Utrecht's Sustainable Transport policy.

For investigating the upgrade of 40 high-priority cycleways, Arcadis developed an innovative and efficient approach to quickly assess the 40 trajectories using a combination of GIS-data-specific location knowledge and active transport design expertise. Arcadis determined which improvements were necessary on these trajectories, identified which crucial elements were in the vicinity of the cycleways, and prepared design solutions and an assessment of their feasibility and costs.

Arcadis also developed a prioritization tool based on the urgency of the improvements and the complexity of realizing the design solution.

Impact:

The outcomes included a Regional Cycling Strategy as well as designs, costs and prioritization. The benefits mean that the province now has a Regional Cycling Strategy and has the insight on how to future-proof their bicycle network, the budget needed and in what order to do so.



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Projects and case studies
Sustainable Transportation

Reducing traffic across 12 counties using Active Arterial Management

Link: Reducing traffic across 12 counties using Active Arterial Management

Challenge:

Atlanta's never been known for its quick commutes. But a population explosion in the Metro Atlanta area—more than 80% growth over the past two decades—and expansion of regional boundaries pushed its roadway capacity to the limit. The congestion was harming economic opportunities, safety and quality of life measures.

The roadway layout, a mostly radial network of arterials and interstates, left the region with few options for improving traffic flow. The Georgia Department of Transportation (GDOT) wondered: If the network couldn't be built bigger, could it be made smarter?

Solution:

Our mobility experts helped GDOT strengthen its Regional Traffic Operations Program (RTOP) by building a collaborative culture between our team's resources, GDOT, local agencies and many innovative Intelligent Transportation System vendors. They envisioned one program that delivered services to support regionwide goals and provided transparent, accessible reporting to all stakeholders.

Sharing resources, including people's skills and expertise, and field asset control would enhance network management, data-driven decision-making and collaboration between GDOT working teams and stakeholders. Arcadians in charge of project management established an environment for enhancing regional cooperation, pursuing technology that broadens engineers' capabilities and remaining nimble enough to solve unforeseen challenges such as the I-85 bridge collapse in 2017.

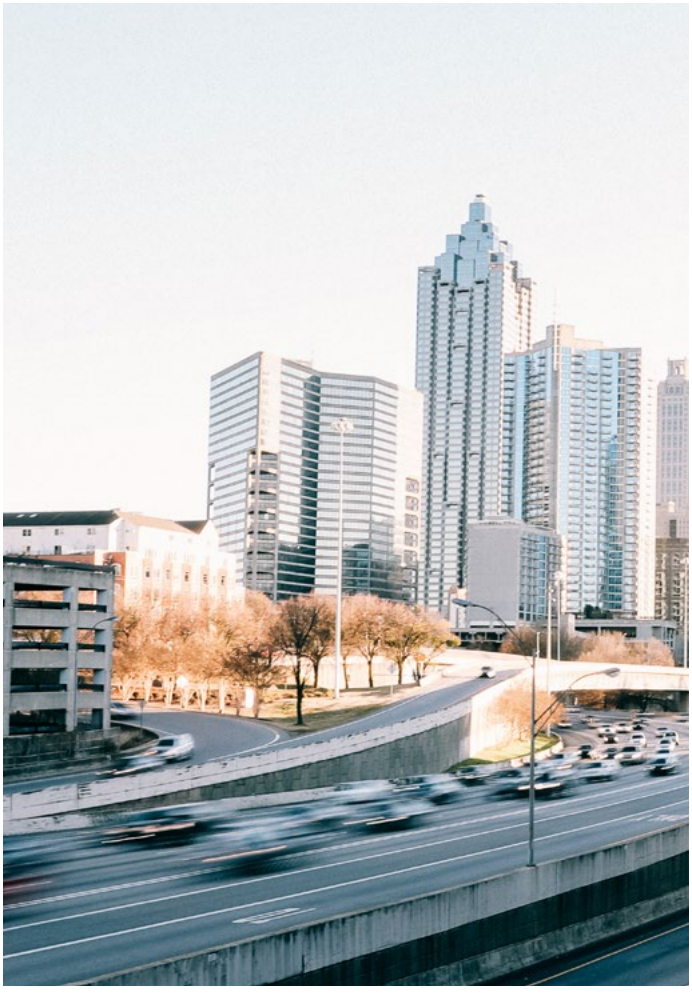
"We saw a region trying to manage its congestion problem across different agencies and priorities. There was enormous potential for improved traffic flow if all required resources were managed under one team. That would effectively deliver the ultimate goals of the program to the region," said Shahram Malek, Vice President at Arcadis.

Impact:

The current RTOP is comprised of 3,200 traffic signals across 24 agencies, leverages digital tools and improved communication for monitoring and controlling the region's traffic flow. Intuitive real-time displays and system features help teams share insights on network problems and potential remedies. A regional communication network that spans across agencies ensures a unified traffic control network.

GDOT's traffic signal operation is improving traffic operations and reliability, eliminating more than 10 million motorist hours and saving more than five million gallons of fuel. RTOP is also creating significant ripple effects throughout the region that go beyond the core program. With GDOT managing some of the counties' signals, local agencies have more resources they can direct to non-RTOP assets, improving the public service delivery.

The resounding success has led to 400% program expansion of the original scope to manage congestion using AAM in the Atlanta Metro area and beyond, and the team continues to explore ways to innovate future phases. As RTOP expands and connected and autonomous vehicles become more prevalent, Atlanta's penchant for congestion might become a thing of the past.



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A visionary approach to improve sustainability in real estate

Link: Biodiversity reviews of new Immobel construction projects

Challenge:

Belgian property developer Immobel is known for its sustainable real estate projects in Belgium and Europe. Biodiversity is high on their agenda, both in rural and built-up areas. By focusing on green spaces and nature-based solutions, they aim to create value for the property developer and end user. Immobel calls on Arcadis in order to concretely assess its efforts and improve them where necessary.

Solution:

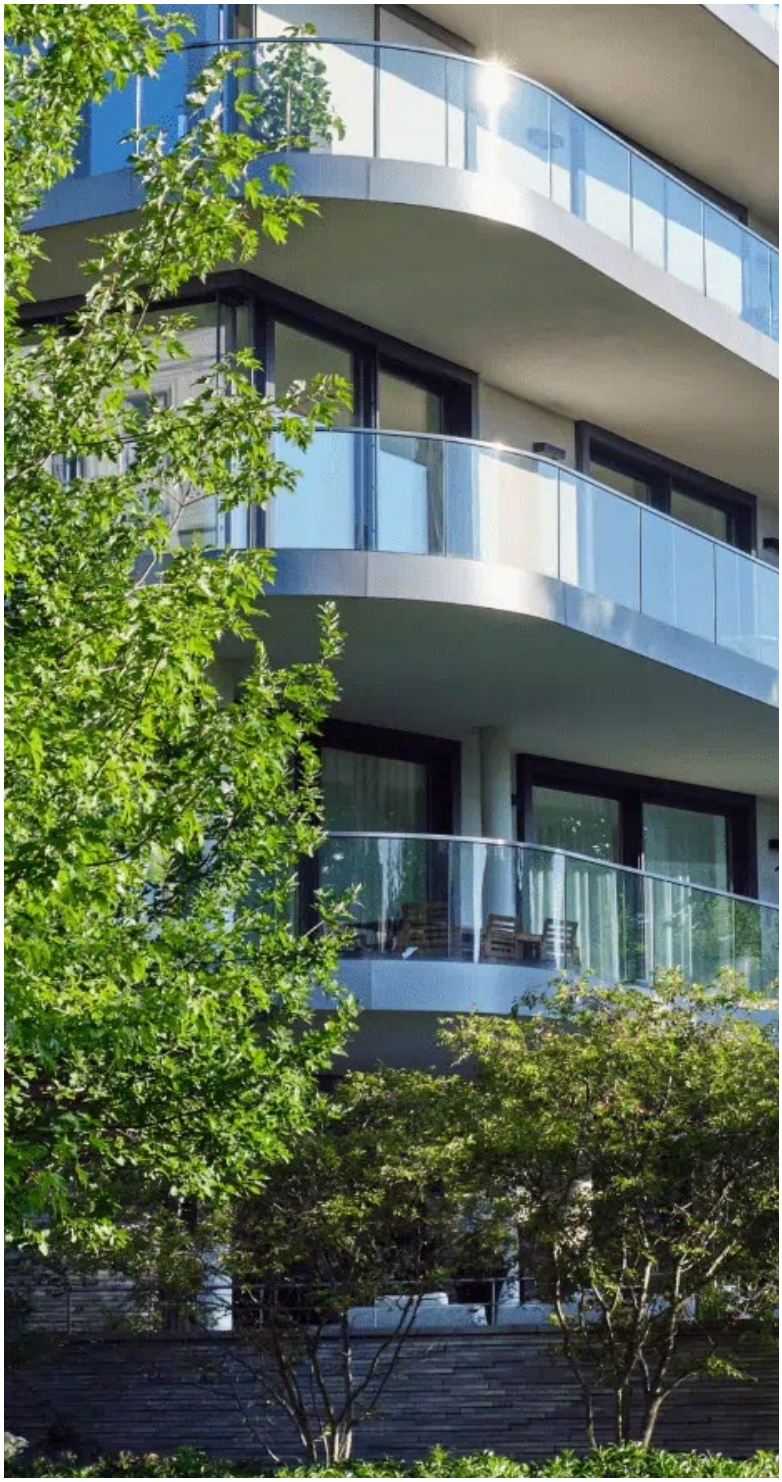
An initial pilot project was launched for the Crahiat project in Ciney, where we calculated the biodiversity gain for this planned new development over 11.5 hectares and made practical recommendations to further increase this score. To do so, we used the Arcadis Biodiversity Net Gain Calculator, a tool developed by Arcadis.

Using this tool, we quantified the site's biodiversity based on mean species abundance, which resulted in a baseline measurement consisting of tangible data that allows us to monitor the current and the potential biodiversity value of this property development. In addition, we can use this biodiversity tool to compare various development scenarios and determine whether certain measures have an impact on the result. In this way, Immobel can take additional measures, where necessary.

The Ciney-based project was completed successfully, and further collaborations are in the pipeline.

Impact:

By working with Immobel and gauging the impact of their efforts, they can concretely demonstrate their biodiversity gains, which creates value for both developers (buyers are prepared to pay more for living in green spaces) and end users. The latter can enjoy the benefits of nature and greater biodiversity in their living environment.



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Leveraging the Arcadis Biodiversity Net Gain Calculator to assess biodiversity impact

Link: Leveraging the Arcadis Biodiversity Net Gain Calculator to assess biodiversity impact

Challenge:

Spadel, the regional leader in natural mineral water brands, is moving toward 100% sustainable operations and products. The team asked Arcadis to measure the impact of its biodiversity measures being taken in Spa, compile a scientifically quantified score and help the company to communicate a clear vision for the future.

Solution:

Arcadis investigated, based on government maps and fieldwork, how Spadel's impact on the land and biodiversity has changed since its foundation. We used Arcadis' Biodiversity Net Gain Calculator (BNCG) to quantify both the positive and negative effects.

The tool focuses on land use and is based on the average species richness (Mean Species Abundance), or MSA for short. Spadel achieved an exceptionally high score, proving that it actively improves biodiversity in the region.

Together with Spadel, Arcadis developed a vision and ambition for the future, in line with the guidelines of the Science-Based Targets Network. These results were explained during a round table discussion with King Filip and Queen Mathilde of Belgium, on Spadel's 100th anniversary. Arcadis moderated this discussion.

Impact:

Biodiversity is a major focus in the fight against climate change, with many new biodiversity targets being formulated internationally. Biodiversity is also critical to the success and future of Spadel, because clean water comes from a healthy environment and a healthy environment depends on healthy biodiversity.

Sustainable business operations have long ceased to be guesswork. Thanks to this collaboration, Spadel strives for a sustainable world through very concrete and measurable environmental protection actions: lower carbon footprint, emphasis on packaging recycling, protection of biodiversity, setting boundaries for the protection of water catchment areas and ensuring the safety of employees and local people. In this way, consumers can be sure that they are buying a sustainable and environmentally conscious product.

Bringing life back to Lake Makermeer

Link: Bringing life back to Lake Markermeer

Challenge:

With nearly one-third of the country below sea level, people living in the Netherlands are faced with the constant risk of flooding. As a result, over the centuries, the Dutch have become world-renowned for their expertise in water management. The Afsluit and Houtrib Dikes are two examples of spectacular waterworks projects that provide protection to millions of people. But they have also had unintended negative consequences for nature. The dikes have created two lakes, Lake IJssel and Lake Markermeer, water which was previously connected to the North Sea.

In Lake Markermeer, now that the water is no longer subject to the tides, the marine environment is stagnant, and there is a high concentration of sediments like sand, clay and silt. This, combined with the lack of landmass in the lake, means that Lake Markermeer is a hostile environment for fish, birds and other living creatures. The Dutch wildlife conservation NGO Natuurmonumenten and the Dutch Ministry of Public Works decided to take steps to stimulate life in Lake Markermeer.

Solution:

The construction dredging, and marine services company Boskalis devised a plan to build several islands in the lake, with the goal of creating a new nature reserve: a place for plants and animals to flourish. Boskalis asked our experts to help with the design of the islands and help ensure they won't be blown or washed away over time. The islands also needed to be outfitted with various dunes, mudflats, jetties and other natural barriers to help create a safe environment for fish to spawn and birds to feed and nest.

The result is the Marker Wadden Islands, an archipelago that is similar to the Wadden Islands along the coast at the North Sea. The first phase of the project involved the creation of five new islands: 1,000 hectares of new landmass. These islands are made completely out of sand, clay and silt that was taken from the bottom of Lake Markermeer. In total, 30 million cubic meters of sediment was used to make the islands. Arcadis experts in sand morphology helped ensure the long, sandy shores of the islands provide adequate protection for the swamp lands and shallows behind them. This creates attractive areas for fish and other wildlife. In contrast to traditional structures such as steep dams and dikes, the gradually sloping natural banks create a dynamic transition between land and water. This has given Lake Markermeer a totally new look and has also improved the ecosystem for plants and animals.

The Marker Wadden Islands are also a treasure trove for science. The islands form a living laboratory for researchers studying how best to develop new natural systems. Arcadis experts worked together with experts from Boskalis, Wtteveen+Bos and Vista to deliver this revolutionary project. Arcadians contributed to the design of the islands, maintenance of the sandy shores, stakeholder engagement and we managed the licensing procedures.

Impact:

The construction of the Marker Wadden Islands transforms Lake Markermeer into a more dynamic environment that enriches animal and plant life. The first phase of the project was completed in 2020 with the establishment of the five new islands and the surrounding shallow wetlands. By far, the largest part of the Marker Wadden consists of closed nature reserves. However, one of the islands is also open to the public and includes a visitor center, a play area for children, hiking trails and a watchtower.

The intended results were already visible during construction, when scores of birds descended upon the project site. This included numerous endangered species. The new nature reserve has also helped with the recovery of the underwater landscape. Arcadians have contributed valuable expertise, which has helped transform a desolate, manmade lake, into a marine environment that is teeming with life.

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Arcadis' biodiversity footprint and targets

Link :Arcadis' Biodiversity Footprint & Target

In early 2023, Arcadis completed an assessment of our impact on biodiversity and nature. This assessment is the first step toward managing and improving the impact that our operations have on biodiversity and nature. Specific objectives of the assessment included:

- Perform Step 1 and 2 (materiality assessment and priority-setting) to fulfill the Science Based Targets for Nature (SBTN) requirements.
- Calculate a biodiversity footprint for the Arcadis building portfolio: High-level + recommendations for detailed approach.
- Establish nature / biodiversity targets based on robust scientific evaluation.
- Improve WBCSD score for nature/biodiversity category to minimum member level.

Global goal for nature

The Global Goal for Nature aims to reach a biodiversity positive outcome for dynamic impacts between now and 2030, i.e., to offset any negative impacts occurring between now and 2030.

In parallel, the objective of the Global Goal for Nature is to compensate for static or historical impacts by 2050.

Dynamic footprint: the footprint caused by changes, consumptions, or restorations during a specific period (e.g., accounting year).

Static footprint: a footprint including all the 'persistent' or 'long-lasting' effects which remain over time. This static footprint can result from spatial pressures (land use, fragmentation, encroachment) that are linked to existing facilities and the persistent (and constant) effect impacting biodiversity today.

Arcadis' biodiversity targets at a glance

Targets for land use:

- No net biodiversity loss will occur at Arcadis sites WW (based on land intake changes and mean species abundance scores)
- For Arcadis sites with > 20% open area, Arcadis will deliver a biodiversity net gain of 10% by 2030
- 2030 as the target year is aligned with the Global Goal for Nature, which aims to reach a biodiversity positive outcome for dynamic impacts by 2030
- Prior to 2050, Arcadis' static (or historical) land use-based biodiversity impact (65 MSA.ha) should be compensated for adhering to the 2050 goal to restore nature.

For freshwater, target-setting guidance focuses on organizing water withdrawals at the basin level. Because Arcadis does not withdraw water for production processes, an appropriate target-setting approach will have to be developed in a subsequent phase. Since current water use estimates are based on industry averages and headcount data, the next step is to collect accurate water use data for each Arcadis site.

Science-based targets for nature framework

Science Based Targets for Nature (SBTN) manages a corporate engagement program where businesses commit to set science-based targets for nature. Arcadis formally committed in 2022. The presentation below explains Steps 1 through 3 (out of five total steps) of the SBTN requirements and the results of Arcadis's self-assessment (including how the goals above were determined). This assessment was submitted to SBTN for approval and work is continuing to collect more data on how our operations impact nature and biodiversity.

Restoring the health of Burrard Inlet

Link: Restoring the health of Burrard Inlet

Challenge:

Ongoing colonization of the environment and natural resources has negatively impacted life for Indigenous communities across Canada.

As people who have lived in and stewarded the north shores of Vancouver since time immemorial, the Tsleil-Waututh Nation is working to protect and restore their land and waters from industrial development on the shoreline and contaminants in outfalls and stormwater. Environmental contamination and a declining ecosystem have led to a disruption to the community's historic fishing, harvesting and cultural practices.

Solution:

Arcadis, previously Arcadis IBI Group, has worked with the Tsleil-Waututh Nation for over 15 years to support their stewardship activities and scientific research and analysis within the Burrard Inlet and Indian Arm.

Throughout the years, we have conducted sediment and biota sampling programs (particularly shellfish meat) at various beaches located within Burrard Inlet and Indian Arm. Our team has done routine assessments and remediation of contaminated sites on the land that may contribute to contamination entering surface water within the Inlet, and we assisted the Nation with the removal of creosote-treated piles from select locations within the Indian Arm.

As part of our collaboration, we are developing and conducting long-term, routine surface water quality monitoring of creeks and outfalls to identify contaminant sources (both chemical and biological) to improve surface water quality within the inlet and ultimately restore traditional harvesting opportunities. We are assisting the Nation in reviewing and developing Burrard Inlet-specific water quality objectives and reviewing the Canadian Disposal at Sea Regulations.

To identify and minimize the adverse impacts of post-contact development within TWN's traditional territory, we developed and managed sampling programs to assess and identify opportunities to improve surface water quality within streams that are used by community members for ceremonial bathing and cleansing.

Impact:

We are building capacity within the nation so that TWN members and staff within the Treaty, Lands and Resources Department can undertake safe and appropriate surface water, sediment and biota tissue sample collection, manage environmental data collected within their territory, and take ownership of long-term monitoring programs.

The Burrard Inlet Action Plan has led to improvements in water quality and reduced environmental contamination, leading to long-term goals of restoring traditional harvesting sites and cultural practices. Alongside the Tsleil-Waututh people, we are actively supporting the restoration of the Burrard Inlet ecosystem.

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Securing financing for an urban biodiversity project

Link: Ecological restoration of mines and wetlands in Daye City

Challenge:

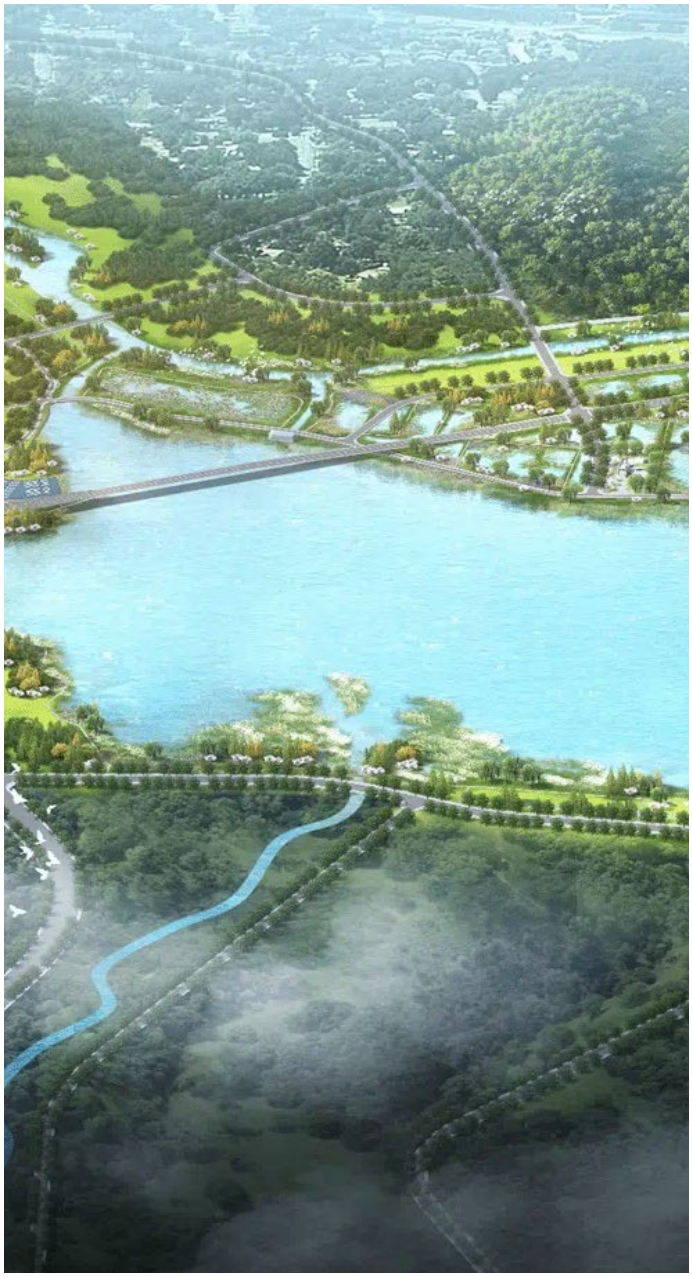
Daye, which literally means 'grand foundry' in Chinese, is a historically significant mining city in Hubei province, located near Wuhan along the Yangtze River. It stands at a critical juncture in its development. Once famed for its robust mining industry, Daye is now heavily polluted by mining activities and grapples with the imperative of transitioning towards a sustainable and resilient future. Financial assistance and international expertise are crucial to addressing pollution and restoring its natural environment

Solution:

Experts from Arcadis France China, and Belgium, specializing in urbanism, ecology, water and mine remediation, in partnership with a local Chinese team, are aiding Daye in conducting a comprehensive feasibility study. The objective is to secure a €100 million loan from the French Development Agency for mine remediation, restoration of wetlands, forests and watersheds in Daye's urban area, and the creation of a green belt around the lake with pleasant public spaces. This initiative aims to address severe environmental degradation and transform the landscape into a thriving ecological and recreational zone, serving as a green lung for the city.

Impact:

The feasibility study will pave the way for funding a transformative project that champions sustainable urban development, enhances urban ecology and elevates the quality of life for Daye's residents. Beyond environmental restoration, the project will spotlight Daye's industrial heritage, reinforcing its unique identity and contributing significantly to the city's holistic revitalization. By integrating environmental, economic and cultural dimensions, this initiative aims to create a model for sustainable development in historically industrial regions.



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Transforming lives by putting people at the heart of urban regeneration

Link: Livable neighborhoods program

Challenge:

Like many cities around the world, the climate emergency and the Covid-19 pandemic have created a need to rebalance the places where we live and work to put more emphasis on the needs and aspirations of residents. Following the Scottish Government's commitment to deliver a net zero society, and the emphasis on the 20-minute neighborhood within the National Planning Framework 4, Glasgow City Council has established the Connecting Communities Program to deliver Liveable Neighborhoods (LN) in six tranches.

The team, led by Arcadis, worked on two inner city LN areas to deliver strategic frameworks and concept design schemes for selected projects, supported by business cases. We set out a vision for how they could look, and how this would bring maximum benefit for all residents.

Solution:

The Place Standard tool and four key themes in the Glasgow LN toolkit (comprising 'local town centers', 'streets for people', 'active travel' and 'everyday journeys') are the guiding criteria for the project. Our multidisciplinary team identified five sub neighborhoods in each LN area and held community engagement workshops, supported by digital engagement methods, that encouraged a co-design approach to identify issues and opportunities and shape design proposals.

Through this exercise, a long list of opportunities was identified which culminated in a range of priority projects that support the creation of communities which are connected, accessible and well serviced. The team then devised strategic masterplans for each LN area, comprising 20 to 25 project proposals which were carefully selected based on their potential to maximize benefits, and capacity to deliver the overarching climate agendas of local and national government. We also drew upon lessons learned and success stories from similar projects all over the world.

Our top priority was ensuring that the proposals and designs would really work for the people living in these areas, particularly the most deprived or vulnerable. Many of the project proposals that emerged are highly focused on sustainability and urban resilience, including:

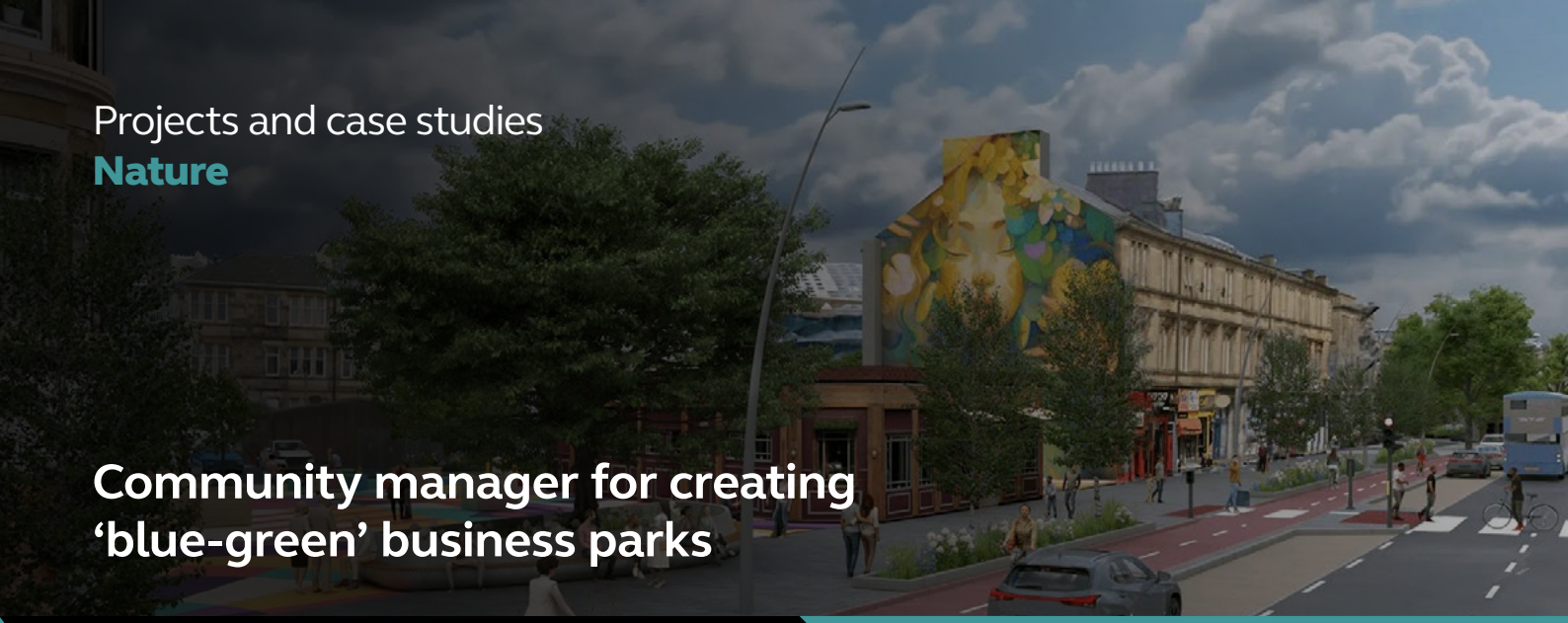
- introduction of interconnected active travel routes on high streets and wider city networks (segregated and shared bi-directional routes), through the city parks and open spaces
- gradual reduction of road speeds and redesign of junctions to create new civic spaces and continuous footways on side-street junctions, with places for rest
- reinstating railway stations
- creating well-equipped play spaces, allotments, and multifunctional civic spaces through tactical urbanism measures and by supporting local art projects
- improved public realm through tree-lined avenues with wildflower meadows as pollinators for biodiverse habitats and rain gardens and permeable open spaces as part of sustainable drainage systems
- strengthening local centers and shopping streets with core amenities and facilities and meanwhile uses
- child-friendly low-traffic neighborhoods, one-way streets, traffic calming measures and safe walking and cycling routes for children to schools, including transforming bridges across the railway line as green bridges with safe active routes to schools.

Fourteen project proposals were taken forward as nine schemes, based on their potential to deliver the most environmental, social and economic benefits. Sustainability is a cornerstone at all stages of design. In our concept designs, we paid close attention to identifying opportunities to reuse and adapt the existing urban fabric, focusing on modular design, nature-based solutions, and waste reduction with potential for circularity of materials.

Impact:

These strategic masterplans and concept design schemes are about comprehensive, aspirational but deliverable urban regeneration, and benefit the entire community, particularly those who need it most. A key concept running through the Liveable Neighbourhoods program is the 20-minute community—which is compact and connected and can meet the majority of the daily needs of local people within a reasonable walk, wheel or cycle (within approx. 800m) of their home. It means that reliance on cars reduces, and streets become safer, quieter and more pleasant places to be. The benefits to people and the environment are clear: fewer cars on the road and better access to employment, schools and services.

Managing change on such a large-scale means managing its pace. The phased approach to achieving such a transformation means that benefits will be felt immediately, both to reassure residents, and to gain time to properly assess the effectiveness of various initiatives before full implementation. It also makes room for involving the community in a more meaningful and consistent way, and has captured their aspirations for functional, beautiful and accessible spaces.



Community manager for creating ‘blue-green’ business parks

Link: Moving toward green climate-resilient business parks

Challenge:

The effects of climate change are evident across the Netherlands, including on business parks. But many stakeholders do not know how to make existing and new sites climate-adaptive and biodiverse. At the same time, there are many sites that are in need of revitalization and improvement, and which are feeling the pressure of meeting energy transition targets. The introduction of climate-resilient solutions can help to tackle many of these challenges, but a lack of knowledge and fragmented interests often prevent a coordinated and successful approach.

Solution:

To prepare business parks for climate change, ‘Samen Klimaatbestendig’ (climate-resilient together) is building a new network of people to share experiences and knowledge of green and climate-resilient solutions. Some examples include passive cooling methods to reduce the temperature and collecting rainwater to allow business activities to continue even in the case of heat or heavy downpours. For local businesses, this will help to reduce energy bills and the risk of property damage.

As community manager, Arcadis supports the network by providing a wealth of experience, knowledge and useful contacts. As an industry, our insight and overview of available knowledge is growing, and together we can bring expertise around new techniques, regulations, policies, funding models and communication strategies, all supported by practical examples of implementation.

As community manager, we can build and enhance this valuable network to identify challenges, find solutions, and unite diverse interests, parties and above all, people. In this way, we connect people and networks and help set the agenda, raise awareness and draft new policies, aligning with all relevant parties and engaging with government agencies. For this work, we can draw on experience gained from many other projects Arcadis is carrying out with and on behalf of companies and business parks, such as pilot studies, policy development, process guidance and design.

Impact:

As community manager, our efforts are helping to accelerate the delivery of blue-green infrastructure in business parks throughout the country. We have been committed to supporting the needs of stakeholders and the environment from the outset, as a result of which we were awarded €26 million from the National Growth Fund for the project ‘Werklandschappen van de Toekomst’ (working landscapes of the future).

Clever design can make any business park attractive for customers, employees, plants and animals. It also reduces the damage caused by rainwater, impassable roads, hot parking lots or machines that overheat. Companies and visitors can benefit from a sustainable and well-planned blue-green business park.